Lesson 14: Converting Rational Numbers to Decimals Using Long Division

Classwork

Example 1: Can All Rational Numbers Be Written as Decimals?

Using the division button on your calculator, explore various quotients of integers 1 through 11. Record your fraction representations and their corresponding decimal representations in the space below.

What two types of decimals do you see?

Example 2: Decimal Representations of Rational Numbers

In the chart below, organize the fractions and their corresponding decimal representation listed in Example 1 according to their type of decimal.

What do these fractions have in common?

What do these fractions have in common?



Lesson 14: Date:

Converting Rational Numbers to Decimals Using Long Division 10/27/14



Example 3: Converting Rational Numbers to Decimals Using Long Division

Use the long division algorithm to find the decimal value of $-\frac{3}{4}\,.$

Exercise 1

Students convert each rational number to its decimal form using long division.

a.
$$-\frac{7}{8} =$$

b.
$$\frac{3}{16} =$$



Example 4: Converting Rational Numbers to Decimals Using Long Division

Use long division to find the decimal representation of $\frac{1}{3}$.

Exercise 2

Calculate the decimal values of the fraction below using long division. Express your answers using bars over the shortest sequence of repeating digits.

a.
$$-\frac{4}{9}$$

b.
$$-\frac{1}{11}$$

d.
$$-\frac{5}{6}$$

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Example 5: Fractions Represent Terminating or Repeating Decimals

How do we determine whether the decimal representation of a quotient of two integers, with the divisor not equal to zero, will terminate or repeat?

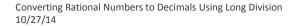
Example 6: Using Rational Number Conversions in Problem Solving

a. Eric and four of his friends are taking a trip across the New York State Thruway. They decide to split the cost of tolls equally. If the total cost of tolls is \$8, how much will each person have to pay?

b. Just before leaving on the trip, two of Eric's friends have a family emergency and cannot go. What is each person's share of the \$8 tolls now?



Lesson 14: Date:





Lesson Summary

The real world requires that we represent rational numbers in different ways depending on the context of a situation. All rational numbers can be represented as either terminating decimals or repeating decimals using the long division algorithm. We represent repeating decimals by placing a bar over the shortest sequence of repeating digits.

Problem Set

Convert each rational number into its decimal form.

$$\frac{1}{6} =$$

$$\frac{1}{9} =$$

$$\frac{2}{9} =$$

$$\frac{1}{3} =$$

$$\frac{2}{6} =$$

$$\frac{3}{9} =$$

$$\frac{3}{6} =$$

$$\frac{1}{9} =$$

$$\frac{5}{9} =$$

$$\frac{2}{3} =$$

$$\frac{4}{6} =$$

$$\frac{6}{9} =$$

$$\frac{5}{6} =$$

$$\frac{7}{9} =$$

$$\frac{8}{9} =$$

One of these decimal representations is not like the others. Why?



Enrichment:

- 2. Chandler tells Aubrey that the decimal value of $-\frac{1}{17}$ is not a repeating decimal. Should Aubrey believe him? Explain.
- 3. Complete the quotients below without using a calculator and answer the questions that follow.
 - a. Convert each rational number in the table to its decimal equivalent.

$\frac{1}{11}$ =	$\frac{2}{11}$ =	$\frac{3}{11} =$	$\frac{4}{11}$ =	$\frac{5}{11}$ =
$\frac{6}{11}$ =	$\frac{7}{11}$ =	$\frac{8}{11} =$	$\frac{9}{11}$ =	$\frac{10}{11}$ =

Do you see a pattern? Explain.

b. Convert each rational number in the table to its decimal equivalent.

$\frac{0}{99} =$	$\frac{10}{99} =$	$\frac{20}{99} =$	$\frac{30}{99} =$	$\frac{45}{99} =$
$\frac{58}{99} =$	$\frac{62}{99} =$	$\frac{77}{99} =$	$\frac{81}{99} =$	$\frac{98}{99} =$

Do you see a pattern? Explain.

c. Can you find other rational numbers that follow similar patterns?

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